

THE NORTH AMERICAN SPECIES OF CALLIMORPHA LATR.

By JOHN B. SMITH.

(With one plate.)

The species of *Callimorpha* are graceful, rather slightly built moths, with comparatively large wings and smoothly clothed body. Head rather small, but distinct, not at all retracted; eyes large, globose, naked; ocelli present; front broad subquadrate; tongue moderate in length, corneous. Palpi slender, middle joint much the longest. Antennæ slender, filiform, with a single fine bristle at each side of each joint in both sexes; stronger, however, in the male. Thorax short, oval; abdomen elongate, reaching to or exceeding anal angle of secondaries, cylindric subequal throughout. Legs closely scaled, anterior tibia much the shortest, posterior pair much the longest, middle tibiæ with a pair of terminal spurs only, posterior with two pairs. Tarsi distinctly spinulated. Primaries with distinct, somewhat acute, apex and slightly oblique, rounded outer margin. Twelve veins. Internal vein not furcate, 2 from the submedian, 3, 4, and 5 from the same vein at the end of the cell at equal distances. Six from the upper edge of the cell—a distinct accessory cell from which arise veins 7 to 10—8 and 9 on a stalk; the cell is variable in size and shape even in the same species, and there is, therefore, some inconstancy here. Vein 11 from the subcostal one-third from the end of cell to costal margin. Costal vein (12) as usual. Secondaries 8 veined, two internal veins. Veins 3, 4, and 5 are nearly equidistant at the end of the median vein, 6 and 7 formed by the furcation of the subcostal at the end of the cell. Costal vein from the subcostal some distance from base. The venation is somewhat variable, but after the same general type. Frenulum present. In the ♂ simple, sliding in a loop from the costal margin. In the female compound covered by a few crossed hairs on the median vein, the loop from costa wanting. The genitalia are all after the same pattern. The hook is very long, slender, and acute; side pieces long, narrow, broadening a little at tip, the angles variably produced.

This genus contains, according to the most recent list, three species, *elymene* Esp., *interrupto-marginata* DeB., and *lecontei* Bd., the latter with four varieties and three synonyms. The first two of these are well marked species which have never caused question as to their limits, but the third, *lecontei*, has bothered authors more than enough—some subdividing it into five species, others referring them all as varieties of one and the same form.

A brief history of the variation of the opinions may not be uninteresting.

Harris, in 1835, in his catalogue of the insects of Massachusetts, named the first variety or species after Boisduval's original description of *lecontei*, calling it *militaris*.

Doubleday, in a letter to Harris* (May, 1839), says:

"Of the *Aretia Lecontei* of Boisd. (Guérin Icon. R. A.), I have all manner of varieties; your *militaris* is another one. The white spots becoming confluent in a different manner will account for all these variations." In June, 1839, he writes: "As to *Callimorpha Lecontei*, and *militaris*, I can only say that at Trenton I took a series of them running one into the other so that one could not draw the line to divide them. Variable insects do not vary in some localities." In September, 1840, he returns to the same subject, and says:† "The larva of your *militaris*, or any allied species, is not in Abbott's drawing. Stephens thinks it a true *Hypercompa*. * * * Stephens says your *militaris* is quite distinct from *Lecontei*, and points out a small white spot near the outer margin as not being present in *Lecontei*. I must acknowledge that I begin to waver in my opinion. He thinks the spots cannot coalesce so as to give the markings of *militaris*."

In Flint's Edition of Harris' Injurious Insects, page 344, figure 165 represents *Callimorpha militaris*, and Harris says of the genus *Callimorpha*: "Some of the slender-bodied *Aretians* with bristle-formed antennæ which are not distinctly feathered in either sex, and having the feelers slender and the tongue longer than the others, come so near to the *Lithosians* that naturalists arrange them sometimes among the latter and sometimes among the *Aretians*. They belong to Latreille's genus *Callimorpha* (meaning beautiful form), one species of which inhabits Massachusetts, and is called *Callimorpha militaris* (Fig. 165), the soldier moth in my catalogue. Its fore wings expand about 2 inches, are white, almost entirely bordered with brown, with an oblique band of the same color from the inner margin to the tip, and the brown border on the front margin generally has two short angular projections extending backwards on the surface of the wing. The hind wings are white and without spots. The body is white; the head, collar, and thighs buff-yellow; and a longitudinal brown stripe runs along the top of the back from the collar to the tail. *This is a very variable moth*;‡ the brown markings on the fore wings being sometimes very much reduced in extent, and sometimes, on the contrary, they run together so much that the wings appear to be brown, with five large white spots. This latter variety is named *Callimorpha Lecontei* by Dr. Boisduval."

This is the first expression by Harris of the variability of the moth. Harris considered the darkest, most spotted form *lecontei*, while the pale form with the oblique band from the inner margin to the tip is his *militaris*. Harris says, in a general way, of the larvæ of *Callimorpha*, that they are more sparingly clothed with hair than the other *Aretians*, are generally dark colored, with longitudinal stripes, feed on various

* Ent. correspondence, 122.

† L. e., 149.

‡ The italics are mine.

herbaceous and shrubby plants, and conceal themselves during the day. He professes ignorance of the larva of *militaris*. Packard, in his Guide, makes the same general statement.

Walker, in the Cat. Lep. B. M. Het., III, 650, divides the North American species as follows:

- A. *Ala posticæ luteæ*.
 a. *Ala antiçæ fuscæ, vittis macularibus albis* CLYMENE Esper.
 b. *Ala antiçæ lutescentes, fusco submarginatæ* COMMA Walker.
 B. *Ala posticæ albæ*.
 a. *Ala antiçæ maculis albis* LECONTEI Boisid.
 b. *Ala antiçæ vitta maculisque duabus albis* CONTIGUA Walker.
 c. *Ala antiçæ vitta maculaque albis* CONFINIS Walker.

He does not know the *militaris* of Harris, which he redescribed as *confinis*, nor the *interrupto-marginata* of De Beauvois, which he names *comma*.

Of *lecontei* he describes four varieties:

- α. Fore wings with four white spots; second nearly round.
 β. Second spot forked; fourth interrupted.
 γ. Like var. β. Third spot nearly divided.
 δ. Like var. β. Second and third spots divided.

Two forms seem mixed here, the true *lecontei* and the species hereinafter named by me *suffusa*.

One of the immaculate forms was afterwards described as *Tanada conscita*, and this is the form named *vestalis* by Packard.

In 1860, Proc. Ac. N. Sc. Phil., 536, Clemens first described one of the immaculate forms as *C. fulvicosta*, and considered it a good species.

Packard, in his Synopsis of the Bombycidae, 1864 (Pr. E. S. Ph., 1864, 107), cites *militaris* as a synonym of *lecontei*, and leaves *contigua*, *confinis*, and *fulvicosta* with specific rank. He also describes as *vestalis* an immaculate form which he says is smaller than the other species and nearly pure white.

In speaking of *fulvicosta*, Stretch, in his Zygaenidæ and Bombycidæ, p. 64, says "of which *vestalis* Pack. is only a synonym."

Morris, in the Synopsis, suppl., p. 345, follows Walker in the synonymy as a rule, omits *lecontei* altogether, but describes four varieties of *militaris* Harris, as follows:

- "Var. a. Primaries with four white spots; second nearly round.
 "Var. b. Second spot forked; fourth interrupted.
 "Var. c. Third spot nearly divided.
 "Var. d. Second and third spots divided."

Messrs. Grote and Robinson, in the Tr. A. E. S., II, p. 72, refer *confinis* Walk. and *contigua* Walk. as synonyms of *lecontei*.

Stretch, in the Zygaenidæ and Bombycidæ of North America, p. 62, gives a synonymy in which he refers *militaris* as a synonym of *lecontei*, makes *confinis*, *contigua*, and *fulvicosta* varieties, and cites *vestalis* a synonym of *fulvicosta*.

He says, p. 63: "Some forms here classified as varieties may prove to be valid species when their history is known, as, for instance, *C. contigua*, which is stated by the editor of the Canadian Entomologist (vol. 1, p. 45) to be quite a constant form." At p. 236 he again refers to the species and quotes a letter from Mr. Saunders, claiming that *lecontei* and *contigua* are valid species; but after all, on the basis of the examples he then had, he does not change the synonymy as above given.

In describing *Callimorpha reversa* he says (Ent. Am., 1, 104): "This species has long been confounded with *Lecontei*. Harris and Doubleday discussed the question of their specific identity, and Canadian entomologists have long contended that two species were included under the latter name, but, so far as I know, without pointing out the most recognizable character, which is to be found in the main transverse band of the primaries. In *Lecontei* this starts from the inner margin and goes to the apex, while in *reversa* it starts from the outer margin and goes to the anal angle, being exactly as in *elymene*. Just as is often the case in the latter species, the transverse band is sometimes partly obsolete near to the costa, and this seems to be the chief variation."

This term embraces two very distinct forms, and he mistakes the type of *lecontei*, which is incorrectly figured in the Z. & B. on Pl. IX, f. 14. Yet it is this very form that he here describes as *reversa*, evidently now considering *militaris* Harris as typical of *lecontei*.

In the Sixteenth Annual Report of the Entomological Society of Ontario, 1886, p. 38, Mr. F. B. Caulfield says: "I have only seen four Canadian species, one buff, *interrupto-marginata*, and three white, *Lecontei*, *contigua*, and one unnamed species which generally passes for *Lecontei*, but certainly is not that species, as I have bred both species, and the larva of *Lecontei* is larger and the colors are duller than those of the larva of the smaller species. *Lecontei* has several varieties, such as *militaris* Harris and *confinis* Walk., and these varieties have much more white on the wings than the type, or, in other words, it varies in the direction of albinism, while in the smaller species the reverse is the case, this species varying in the direction of melanism, in some specimens the white spots being almost entirely covered. * * * *Contigua* is a well marked form and varies very little, but, as I have no specimens at hand, I cannot point out the distinctive features. I am, however, satisfied that breeding the larva will in time prove that we have three white-winged species, *Lecontei*, *Contigua*, and the smaller form which now does duty as *Lecontei*."

In arranging, under Professor Riley's direction, the Museum collections of *Arctiida*, I endeavored in this genus to make out all the listed variations from an unusually abundant material, and I soon found that, while there was a considerable variation, so that an apparently complete series could be made, yet there was at the same time a change in the pattern of the markings, and following out this idea I arranged the species allied to *lecontei* into four distinct species, exclusive of the two

innaculate forms, *fulvicosta* and *vestalis*, which are abundantly distinct from each other, though they may possibly be albino forms of one or the other of the maculate species. I do not believe this, however, and prefer for the present to consider them distinct, though perhaps not strongly marked, species.

An examination of the genital structure proved my idea correct, sufficient constant differences existing to make the distinction certain if not very great.

The scheme of the arrangement in synoptic form is as follows:

SYNOPSIS OF THE SPECIES.

1. Secondaries yellow	2
Secondaries white	3
2. Primaries with costal, outer, and inner margin black margined, leaving the apex and anal angle white, an oblique half band from the outer end of the band along internal margin	INTERRUPTO-MARGINATA.
Primaries with all the margins black bordered, leaving the apex only white, the outer half of wing divided by bands so as to form three white spots along the costal margin and a large triangular spot along outer margin ..	CLYMENE.
Primaries immaculate, pale creamy white	LACTATA.
3. Primaries marked and banded with black	4
Primaries immaculate	7
4. Primaries without a basal cross-band	5
Primaries with a basal cross-band	6
5. Primaries with an oblique cross-band from inner margin to the apex ..	MILITARIS.
Primaries with an oblique band from anal angle to costa two-fifths from apex; the outer part of wing divided into two large spots	CONTIGUA.
Primaries with an oblique band from anal angle to costa three-fifths from apex; outer part of wing divided into four large white spots	SUFFUSA.
6. Primaries brown, with five large white spots, the middle one largest and partly divided	LECONTEI.
7. Size larger; primaries a delicate creamy white	FULVICOSTA.
Size smaller; primaries pure white.	VESTALIS.

C. interrupto-marginata De Beauv. Ins. Afr. et Amer., 265, pl. 24, f. 5 and 6, *Bombix*; Clem., Pr. Ac. N. Sc. Phil., xii, 1860, 153 and 161, *Hypercompa*; Morris, Syn. Lep. App., p. 346, *Callimorpha*; Saund., Syn. Can. Aret., 1863, p. 29, *Hypercompa*; Paek., Pr. E. S. Ph., iii, 1864, 107, *Callimorpha*; Guide, p. 226, f. 216, *Callimorpha*; Beth., Can. Ent., i, 45; Stretch, Z. and B., 66, pl. 2, f. 19, *Callimorpha*; Siewers, Can. Ent., x, 84; id. xi, 47; Strk. Proc. Dav. Ac. Sci., II, 275 (hybrids of).

emma Wlk., C. B. M. Lep. Hct., iii, 652, *Hypercompa*; Clem., Pr. Ac. N. Sc. Phil., xii, 1860, 536, pr. syn.

Head pale fulvous, paler on vertex; palpi yellowish, apical joint blackish brown; antennæ also blackish. Thorax whitish, with a broad dorsal stripe. Abdomen yellow, with a blackish dorsal band of variable width, rarely obsolete. Thorax beneath, and legs yellow, the anterior pair dark brown outwardly.

Primaries creamy white, somewhat more deeply colored towards apex. Costal margin broadly dark brown, nearly to the apex; outer margin also brown from apex nearly to the hind angle; inner margin also broadly brown nearly to the anal angle, giving off at the end a broad,

somewhat recurved band to the center of the wing. Secondaries clear yellow, usually with a blackish spot of variable size near to the anal angle; sometimes this spot is wanting altogether. Beneath yellow with the markings of upper side faintly reproduced, the recurved band from inner margin most distinctly.

Expands 1.60-1.75 inches; 40-44^{mm}.

Habitat.—Canada to Georgia, west to Illinois, Missouri, Wisconsin, Indiana, and Kentucky.

This species is very constant in color and maculation, and dozens of specimens will present the same uniformity of appearance.

In the Proc. Dav. Ac. N. Sc., ii, 275, Mr. Strecker calls attention to some interesting hybrids. He describes a lot of specimens received from Southern Indiana, and says: "But among this lot were also a number of examples that at first fairly puzzled me. They were marked exactly like some varieties of *Lecontei*, and one was immaculate like the var. *fulvicosta* of that species; but the ground color of these was a pale buff, a little darker than in the primaries of *interrupto-marginata* instead of being white; but independent of this uniform yellow color of all wings and body they were to all intents *Lecontei*." He further records the receipt of a ♀ *interrupto-marginata* and a ♂ *lecontei*, taken in copula, and that from the eggs of this ♀ he obtained larvæ, three of which produced imagoes which had the maculation of *lecontei* with the color of *interrupto-marginata*. On pl. iv, f. 5 and 6, two of these are shown, and the markings are precisely those of *militaris* Havr. (See pl. xiv, fig. 3).

In Can. Ent., xi, 47, Mr. Siewers mentions among other things the habit of the moth to fly with a darting motion a few yards at a time, and then, after apparently settling, to continue their flight between the weeds upon which they are said to feed, *Eupatorium ageratoides*. He also mentions and describes certain anal apendages of the male as follows: "Out of the hind segments there issued two plumes over an inch long and less than one-sixteenth in diameter, so light that the least breath of air fluttered them from side to side. They were cut in numerous vertical segments and sparsely covered with short hairs, were semi-transparent, and evidently air-inflated." Mr. Siewers considered these organs as aids to flight, but observation since made shows that they have other functions. I cannot find that they have been observed since.

In the tenth vol. Can. Ent., p. 84, the larva is described in a general way on snake-weed. "The weeds were covered with the larvæ, of a bright yellow color with a white lateral stripe, mottled along its upper edge with bright red, the anal end being also faced with red markings. The length about 1½ inches." None were raised to maturity, and that these were the larvæ seems to have been a guess, though made as a positive statement. Mr. Strecker's description in Pr. Dav. Ac., ii, 276, is from larvæ obtained from eggs and carried to maturity, and differs

essentially from the preceding. According to him, "The larvæ were black above with rich yellow dorsal and lateral lines, the latter somewhat irregular and broken; also with rows of raised bluish-black tubercles, from whence proceed tufts of short bristles. Beneath it is pale grayish with darker marks. Head black. Feet black, prolegs black outside, pinkish on the inside." They were raised on willow and peach.

These descriptions do not correspond very closely. Mr. Strecker's is most characteristic of the genus, but he had hybrids, and the larvæ could hardly be counted as typical.

The species is locally common.

C. clymene Esper, Schmett., iv, 22, 10 pl., 182; noct. 103 f. 1, *Noctua*; Meig. Syst. Besch. Eur. Schmett., iii, 40 pl. 86, f. 2, *Callimorpha*; Ochs. Schmett. Eur. iv, suppl., 208, *Euprepia*; Hb. Verz., 1816, 182, *Haploa*; Wlk. C. B. M. Lep. Het., iii, 650 *Hypercompa*; Clem. Pr. Ac. N. Sc. Ph., 1860, 536, *Hypercompa*; Morris. App. to Syn. 1862, 345, *Callimorpha*; Saund. Syn. Can. Aret., 1863, p. 28, *Hypercompa*; Pack., Pr. Ent. Soc. Phil., iii, 1864, 107 *Callimorpha*; Beth., Can. Ent., 1, 18: Stretch., Zyg. and Bomb., 172, p. 7, f. 19, *Callimorpha carolina* Harris, Rept. Ins. Mass, 1841, 243; Inj. Ins., 344 *Callimorpha*; Pack., Pr. E. Soc. Phil., iii, 1864, 107, pr. syn.
colona Hb. Bomb., 135, pl. 31, f. 135, *Bombyx*; Wlk. C. B. M. Lep. Het., iii, 650, pr. syn.

Head yellow; palpi with terminal joint black; eyes and antennæ black; collar yellow, with two black dots, one on each side of the middle. Thorax white, pategiæ black edged anteriorly, a broad dorsal black stripe. Abdomen yellow. Thorax beneath and legs yellow; anterior femora, tibia, and tarsi blackish, a black spot on coxæ; median tibia and tarsi blackish outwardly. Primaries white, with a very faint yellowish tinge; completely black margined except at apex, where the white reaches the costa; sometimes, too, the anal angle is clear. A brown band crosses the wing from the anal angle to the costa, about two-fifths from base. From the middle of this band runs another to the outer margin below apex. From the same point as the last-mentioned band a short band goes to costa at the end of the cell. A cross band runs from the subapical band to the costa near apex, leaving thus a large triangular white patch in the wing basally, a series of three large spots along the costal margin, of which the middle is the largest, and a large, triangular patch along the outer margin which is sometimes divided superiorly by black veins crossing it. Often a small white spot in the dusky part of anal angle. The bands vary in width, and the spots sometimes become more or less confluent. As a rule, however, the species is very constant. Secondaries clear yellow, sometimes with sometimes without a black dot near the anal angle. Under side yellow, the markings of the upper side more or less completely, but generally faintly, reproduced.

Expands 1.92-2.10 inches; 48-52^{mm}.

Habitat.—Canada, New York, North Carolina, Georgia, Florida, Texas, Illinois.

This species though widely distributed has not been recorded anywhere as common. Two Texan specimens in the Museum collection are very much paler in color than the generality of specimens, and are entirely intermediate between *suffusa* and *clymene* in this respect. The entire habitus, however, and more particularly the two spots on prothorax, leave no doubt where the specimens are referable. It would be interesting to know whether they are albinos, or whether *suffusa* and *clymene* sometimes mate. The maculation of primaries is precisely identical in both species.

Walker mentions four varieties:

- α Hind wings with three submarginal spots and a marginal streak.
- β Hind wings with two submarginal spots.
- γ Hind wings with one submarginal spot.
- δ Hind wings unspotted.

I have never seen the first and second of these varieties.

In this species the side pieces of the δ have both upper and lower angles produced and somewhat acute, the upper portion, however, much longer than the lower.

I cannot find that the larva has been described.

On plate xiv, figs. 2, and 7-11, are shown the only variations known to me.

C. lactata, sp. nov.

Head and collar yellow; palpi black tipped; antennæ black. Thorax white, immaculate. Abdomen yellow, immaculate. Beneath thorax and legs yellow. Anterior tibia and tarsi and middle tarsi blackish outwardly. Primaries a very pale creamy white, immaculate. Secondaries yellow, immaculate. Beneath yellow, immaculate.

Expands 2.25 inches = 55-56^{mm}.

Habitat.—Texas.

Two female specimens are in the Museum collection (Coll. O. Meske), others are undoubtedly scattered in collections as albino or aberrant forms of *clymene*, which indeed it may possibly be. I prefer to consider it distinct for the present, because I have never seen anything like an intergrading series between the two, and the form will always hold varietal rank anyway, even should it prove specifically identical with *clymene*, which I scarcely believe.

C. militaris Harris, Cat. Ins. Mass., 592, 1835, *Callimorpha*; Ins. Mass., 1841, 243, *Callimorpha*; Inj. Ins. Flint ed., 344 f. 165, = *lecontei* var; Clem., App. to Morris Syn., 354, *Callimorpha*; Grt. Pr. E. S. Ph., iii. 94 *lecontei* var; Pack, Pr. E. S. Ph., iii. 107, = *lecontei* Lint. Ent. Cont., iii. 142.

lecontei † Stretch., Z. & B., 63, pl. 2, f. 20, 21.

confusus Wlk., C. B. M. Het., iii. 65, *Hypercompa*; Clem., Pr. Ac. N., Sc. Ph., 1860, 43, *Hypercompa*; Morr., Syn. App., 345 *Callimorpha*; Saund., Syn. Can. Aret., 28, *Hypercompa*; Pack., Pr. E. S. Ph., iii. 1864, 107, *Callimorpha*; G. & R., Pr. A. E. S., ii. 72, = *lecontei*.

Head pale, creamy yellow; tips of palpi and antennæ blackish. Collar white, more or less marked with pale yellow, often entirely yellow,

rarely entirely white. Thorax white, pategiæ brown-edged anteriorly; a broad brown dorsal stripe. Abdomen white, the thoracic dorsal stripe continued on the basal segments, but much narrowed, and sometimes entirely obsolete. Feet pale yellow, the anterior and middle tibia and tarsi dusky outwardly. Primaries margined with brown along costa to a variable distance, never quite to apex. Internal margin brown to near anal angle. Outer margin brown from apex nearly to anal angle. An oblique band from inner margin about one-third from anal angle to outer margin just below apex. This band varies considerably in width, sometimes becoming obsolete in the upper part of its course and leaving thus only a short spur from the hind margin. In this form there is a very strong resemblance in maculation to *interrupto-marginata*, especially as it is usually accompanied by a shortening of the costal brown margin and a great narrowing of the brown outer margin. Sometimes there is a small spur from the costal brown margin near the apex, and a corresponding one on the oblique band, indicating an approach to an apical spot similar to that in *lecontei*, but the teeth never join, and the course of the oblique band, which is precisely the opposite of *lecontei* and *contigua*, will serve to distinguish this species. Secondaries immaculate white. Beneath white, the maculation of primaries faintly reproduced.

Expands 1.65-1.90 inches=41-47^{mm}.

Habitat.—Canada, Massachusetts, New York, Missouri, Illinois, Indiana, Iowa and Texas.

The essential difference in maculation is in the course of the main oblique band of the primaries, as has been already pointed out, and this species is the white representative of the yellow *interrupto-marginata* as *suffusa* is of *clymene*. It was this species which, according to Mr. Strecker, mated a ♂ with a ♀ *interrupto-marginata*, and produced the hybrid he figures and describes. The side pieces of the male genitalia differ from those of *suffusa* only by having the inferior angle more extended and the superior angle shorter. A reference to the figures on plate xiii will show the forms in all the species.

The insect is locally common, and is widely distributed. The principal variations are shown on plate xiv, figures 3-5.

The larva has not been described.

C. contigua Wek., C. B. M. Het., iii, 652, *Hypercompa*; Clem., Pr. Ac. N. Sc. Phil., 1860, 536, *Hypercompa*; Morris, Syn. Lep. App., 346, *Hypercompa*; Saund., Syn. Can. Aret. 1863, 26, *Hypercompa*; Pack., Pr. Ent. Soc. Phil., iii, 108, *Callimorpha*; G. & R., Tr. A. E. Soc. ii, 72 = *lecontei*; Stretch., Z. & B. 62-237, pl. ix, f. 13, var. *lecontei*; Caulfield, 16 Rept. Ent. Soc. Ont., 1886, 38 an sp. dist.

Head yellow; palpi black tipped; antennæ black. Prothorax yellow, with a double black spot. Thorax white, anterior margin of pategiæ black; a broad black dorsal stripe. Abdomen white, with a broad black dorsal band, forming with the thoracic band a continuous broad

black line from head to tail. Probably this band on the abdomen sometimes breaks up into spots, but none of my specimens show this. Feet yellow, anterior tibia brown outwardly. Primaries white. Costal margins blackish from base nearly to apex. Internal margin blackish from base to hind angle. Outer margin narrowly black margined, leaving apex and a small space above anal angle free. From the anal angle to the costa about two-fifths from apex is a broad oblique blackish band; from the middle of this band to the outer margin below the apex runs another blackish band. There are thus three large white patches. The only variation is in the width of the blackish bands and the corresponding size of the white patches. Secondaries white. Beneath white, the maculation of primaries faintly reproduced.

Expands 1.65-1.75 inches=40-44^{mm}.

Habitat.—Canada, New York, and Massachusetts.

This is a very constant and well-marked species. The oblique band from hind angle forms with the costal band almost a right angle, and the space beyond this band is never divided into more than two spots. It is really surprising that this distinctive feature has not been heretofore pointed out. The side pieces of the male genitalia have the superior angle produced into a moderately long, somewhat curved process, with acutely rounded tip, and the inferior angle produced into a shorter more pointed process.

C. suffusa, sp. nov.

lecontei † Saund., Syn. Can. Arct., 1863, 28, *Hypercompa*; ? Can. Ent., i, 20 (larva); Beth, Can. Ent., I, 45, *Callimorpha*; Stretch, Z. & B., 62 et 237, pl. ix, f. 14; Strk., Pr. Dav. Ac. Sci. ii, 275; Caulfield, Rept. Ent. Soc. Ont., 1886, 38.
reversa Stretch, Ent. Am., i, 104 (in part).

Head yellow; palpi black tipped; antennæ black. Collar yellow, with a small blackish spot each side of the middle, which is sometimes wanting. Thorax white, ptegiæ black-margined anteriorly; a broad blackish dorsal stripe. Abdomen white, with a row of small, dorsal dark spots, rarely forming a complete line, and often entirely wanting. Beneath, legs yellow, anterior coxæ with a black spot, tibiæ dark outwardly, fore and median tarsi blackish. Primaries white; a broad brown costal margin nearly to the apex; a broad brown internal margin from base to anal angle. Outer margin also black margined from apex to near the anal angle. Rarely the margins are connected so that the wing is completely dark margined. An oblique dark band from anal angle to costa about two-fifths from base. From the middle of this band runs another, to outer margin below apex. From this, close to its inception, a short band runs to costa; at its outer third another spur is sent off, also to the costa; forming thus a series of three white spots below costa and beyond the first oblique band, and a larger, somewhat triangular spot near the outer margin, its broad base near the anal angle. This maculation varies in that the dark veins sometimes divide the marginal spot into two or three, or, on the contrary,

the dark bands become attenuated and some of the spots become more or less confluent. Rarely the maculation is almost, but never entirely, wanting. The distinctive feature which is always noticeable is found in the oblique band, which, in this species, reaches the costa about two-fifths from the base, and the white patch on the disk is therefore very obtusely angled on the costa. Secondaries white, immaculate, rarely with a dusky spot near anal angle. Beneath, white, maculation of primaries faintly reproduced.

Expands 1.75-2.00 inches=43-50^{mm}.

Habitat.—Canada, New York, Massachusetts, Georgia, Kansas, Missouri, Illinois, and Texas.

In maculation this species is the exact counterpart of *clymene*, and the size also is nearly the same. The ground color, then, is the only point of difference, superficially; but this removes all chance of confusion, except in the case of specimens like the pale forms of *clymene* hereinbefore described and which may be hybrids. Compared with *contigua*, our species is uniformly larger and heavier.

The side piece of the male genitalia has the superior angle prolonged into an obtusely rounded, subequal process, and the inferior angle simply rounded. It differs, therefore, very decidedly in this respect from *contigua* and still more so from *clymene*.

The larva has been described by Mr. Saunders, Can. Ent., i, 20, as follows:

“Taken June 10, 1863, feeding on horse gentian (*Triosteum perfoliatum*). Length 1.10 inches, nearly cylindrical. Head rather small, bilobed, black and shining, with a few short hairs; mandibles black; palpi pale brown tipped with black; body above black, with transverse rows of elevated, shining black tubercles, from each of which arises a spreading tuft of short bristly hairs; a bright yellow dorsal stripe and a wide band of the same color on each side, this latter intersected with streaks and centered with a broken band of black; about half way between the dorsal and lateral stripes is a row of pale whitish dots, forming a faint, broken line. Under surface dirty grayish white with streaks and dots of brown; feet black; prolegs dirty white on inside, with a patch of shining black on the outside of each. These larva entered the chrysalis state on the 19th and 20th of June, and produced the imago on the 12th and 14th of July. Four specimens were reared, and the moths were as nearly alike as possible, showing no tendency to the remarkable variations attached to this species.” Peach has also been mentioned as a food plant of this species, but it has never been abundant enough to cause damage.

C. lecontei Bd. in Guer., le. Règne Anim., pl. 32, f. 4. *Callimorpha*; Doub. in Harr. Corr., 122, 149; Wlk., C. B. M., Lep. Het. iii, 651, *Hypercompa*; H. Sch., Lep. Ex. p. 72, *Callimorpha*; Clem., Pr. Ac. N. Sci. Phil., 1860, 536, *Hypercompa leucomelas* H. Sch., Lep. Ex., p. 17, f. 431, *Callimorpha*; id., p. 72, pr. syn. *reversa* Stretch, Ent. Am., i, 104 (in part).

Head yellow, tips of palpi and antennæ black. Thorax white, anterior edge of pategiæ brown; a broad brown dorsal stripe. Abdomen white,

with an interrupted dark dorsal line. Legs yellow, anterior and middle tibia and tarsi dusky outwardly. Primaries brownish black. A series of four large white spots below the costal margin, the first basal, the fourth apical. Below the second spot is another of usually smaller size. Close to outer margin, and usually touching the anal angle, is a large, somewhat triangular spot, which is interrupted by the nervures superiorly. This is the maculation of a dark, fully-marked specimen. It varies in the spots becoming more or less confluent, and the course of the dark bands then becomes evident; described in the same manner as are the preceding species; the costal margin is dark nearly to the apex. The internal margin is dark to the anal angle. The outer margin is dark from the apex nearly to the anal angle. Both apex and anal angle are usually left white. From the internal margin near the anal angle a broad, quadrate, dark spot extends to the middle of the wing, in the lower portion of which is usually a white spot. From the middle of this runs a spur to the costa, and in slenderly marked specimens this becomes the representative of the cross-band as found in *contigua*. From the outer upper angle proceeds a band to the outer margin below the apex, and thus the marginal white patch is inclosed and a long subcostal white patch reaching to the apex. This is divided by a spur from the costa to the oblique band. The white disk is divided into two patches by an oblique, slightly angulated band from inner margin to costa, and this band is peculiar to the species and always present though not always complete. An inward spur from the quadrate half band along the median vein usually constricts the second spot, and sometimes divides it. All these marks are indicated in all the specimens, even in those in which the spots are most completely confluent. Secondaries immaculate white, rarely with a blackish dot near anal angle. Beneath white, with the maculation of primaries faintly reproduced.

Expands 1.50 inches=37-38^{mm}.

Habitat.—Canada, New York, and Massachusetts.

This species, to a certain extent, combines the two types of markings of *lecontei* and *militaris*; both oblique bands are present though somewhat modified, and the *militaris* band is most marked. The basal band is the specific peculiarity of the species.

I have taken this species rather abundantly in the Catskills, and of the specimens taken then all were of the one type. I have retained enough to make a fine series combined with the Museum specimens.

In this series of maculate forms the insects in my own collections very fortunately supply the deficiencies in the Museum material, and together these two form a very complete series.

Lintner, in the Ent. Contr., iii, 143, described under the name *lecontei* some specimens of this form, in which the secondaries of the male have four brown submarginal spots in the ♀ and three in the ♂. He also describes a larva in the following terms: "Larva feeding on spearmint

(*Mentha viridis*). Length at maturity 1 inch; tuberculated, bearing fascicles of stiff hairs; dark brown with yellow spots. It made a cocoon just beneath the surface of the ground July 1; from which the moths emerged July 24."

Which of the forms these imagos were is not stated, though it was probably the present species.

C. fulvicosta Clem., Pr. Ac. N. Sc. Ph., 1860, 536, *Hypercompa*; Saund., Syn. Can. Aret., 1863, 26, *Hypercompa*; Pack., Pr., E. S. Ph., 1864, 180, *Callimorpha*; Riley, iii Report 132, f. 56, larva; Stretch, Z. & B., 62 = var. *lecontei*; Saund. Fruit Ins. 197, f. 206.

Head pale yellow, as are also the palpi; antennæ pale brown. Thorax white, rarely with a faint trace of a dorsal line anteriorly. Abdomen white, basal segment often yellowish above. Primaries silky-white, immaculate, save for a very faint fulvous or yellowish shade along the costa. Secondaries immaculate. Beneath white, immaculate.

Expands 1.80-2 inches=47-50^{mm}.

Habitat.—New York, Texas, Missouri, and Illinois.

This has been said to be an immaculate variety of *lecontei*, and, indeed, it may be, but I do not believe it. I have never seen any specimen which in any way was doubtful, and have never seen anything like a series of intergrades between this and *lecontei*. The almost immaculate form mentioned under *suffusa* was evidently a form of that species, because the thoracic band was well marked, the wings have not that shiny appearance peculiar to the present form, and the habitus, which is so difficult to describe, but so readily seen by the trained eye, at once bespeaks a different species. It would need positive proof by breeding to convince me of the specific identity of these forms. I have not been able to dissect a male of this form.

The larva has been described by Professor Riley in his Third Report, p. 134, as follows: "Color velvety-black above, pale bluish-gray sprinkled with black below; a deep orange medio-dorsal line (usually obsolete towards each end) and a more distinct, wavy, broken, yellow stigmal line, with a less distinct, coincident pale line below it. Covered with large, highly polished, roughened, deep steel-blue warts, the irregularities of which, as they catch and reflect the light, look like pale blue diamonds. Closely examined these warts are found to be covered with small elevations, each of which furnishes a short, stiff yellow hair, these hairs radiating in all directions around the warts which are placed as follows: Joint 1, with an anterior transverse row of eight, and a posterior dorsal row of four; joints 2 and 3 each with a transverse row of eight across the middle; joints 4-11, inclusive, each with four circular ones anteriorly, and two irregular ones posteriorly on dorsum (each of the last evidently formed by the blending of two), and two on each side near the middle of the joint; joint 12 with two that are irregular on the back, and one that is circular on each side. Anal shield formed of one

large irregular wart. In addition to these there is a narrow subventral wart on each side, and two large ventral ones on each of the legless joints. Head polished black with a few black hairs. Thoracic legs polished black, but pale at the joints inside; prolegs black outside, flesh-colored within and at extremities. Stigmata not perceptible. Largest in the middle of the body. Average length 0.90, greatest diameter 0.15 inch."

Food plant peach. Spins a slight cocoon of white silk, changing to a pupa of a purple-brown color, finely and thinly punctured, and terminating in a horizontally flattened plate which is furnished with numerous yellowish-brown curled bristles. The moth issues from this chrysalis during the fore part of June.

C. vestalis Pack., Pr. E. S. Ph., iii, 108, 1864, *Callimorpha*; Stretch, Z. & B., 62=*fulvicosta*; Grote, New List, var. *lecontei*.
conscita Wlk., C. B. M. Het., 32-377, 1865, *Tanada*; G. & R., Tr. A. E. S., ii, 85=*lecontei*; Stretch, Z. & B., 62.

Head very pale yellow, antennæ very pale brown. Thorax and abdomen white, immaculate, legs pale fulvous. Primaries white, usually immaculate, often with the costal and outer margin a little dusky. Secondaries and underside pure white.

Expands 1.30-1.50 inches = 33-37^{mm}.

Habitat.—Canada, New York, Iowa, Eastern, Northern, Middle, and Western States.

This has been referred as a synonym of *fulvicosta* directly, and of *lecontei* indirectly, and it certainly is neither the one nor the other. It might possibly have been referred as a variety of *militaris*, but even this I do not believe, for I have never seen a specimen of this form with the internal margin dusky, nor, on the contrary, have I ever seen any specimen of *militaris* in which this dusky internal margin was not present.

In addition to the superficial characters, however, the genitalia show a decisive difference, and resemble those of *elymene* very closely while differing markedly from *militaris*. The superior angle is drawn out and somewhat acutely rounded. Inferior angle conically produced, rounded at tip. A comparison of the figures on plate — will serve to show the differences

The larva of this form has not been described.

The foregoing species treated in detail are all in the Museum collection, and most of them in several specimens. The belief has been held so long that these species were varieties merely, that it will seem an extremely radical revision of the genus. However, though not a "splitter" by any means, I cannot avoid the conviction that *all* the forms noted by me are, without exception, good species. I hope that those who may disagree with me will try to prove me in the wrong by careful breeding.

POSTSCRIPT.

Sometime after handing in the MSS. of the foregoing paper, Mr. A. G. Butler, of the British Museum, writing to me on other matters, mentioned that he had recently made some study of the American species of *Hypercompa*, and had made some discoveries which would be something of a surprise. I immediately wrote him, stating the result of my studies, and he very kindly sent me a statement of what he had concluded. He says: "As you are about publishing on the genus, I think it will be more for the advancement of science that I should send you my facts than that you should repeat often repeated errors, and I should come in afterwards and worry you by showing them to be so."

"The *H. clymene* of Brown* takes priority of *H. interruptomarginata* by several years, and his species being figured in colors, there can be no mistake about it."

"The *H. clymene* of Esper, published later by several years than that of Brown, will therefore take the name of *H. colona* Hübn."

After giving some notes on the specimens in the British Museum, with sketches of Mr. Walker's type forms, Mr. Butler adds:

"I would make about six American species, thus:

1. *H. conscita* = *restalis* var. = *fulvicosta* var. and links to *H. carolina*.
2. *H. carolina* (with links to *H. clymene* and *H. colona*) = *H. clymene* var.
3. *H. contigua* (linked to *H. clymene* through *H. carolina* var.) and links to *H. colona*.
4. *H. colona* and numerous links to *H. lecontei*.
5. *H. lecontei* and links to *H. confinis* (including *H. militaris*).
6. *H. confinis*.

"But for *H. militaris* the last-mentioned species would stand apart as a fairly well-defined species."

Mr. Butler considered the white species which I have named *suffusa* as an albino form of the yellow *clymene* (*colona*).

He has sent me sketches of some of the so-called intermediate forms, which, however, are all referable without any hesitation as variations of one or the other of the species I have recognized, and I cannot consider them links.

Mr. Butler, and with him the English entomologists generally, use *Callimorpha* for *Jacobaea* (which Mr. Butler says is a *Lithosian*) and uses *Hypercompa* Stephens, for *dominula* and allies. I prefer to follow Standinger and other Continental authors who use *Callimorpha* in the same sense that Mr. Butler uses *Hypercompa*.

Mr. Butler further considers that the American species are not congeneric with the European, and proposes to use *Haploa* Hb. for our species. The following are the differences enumerated by him:

"Wings shorter than in *Hypercompa*, with shorter costal margin to

*Peter Brown's Illustrations of Zoology, 4th, London, printed for B. White, at Horace's Head, Fleet street (1776), pl. xxxviii, p. 96. Mr. Butler sends the above reference and the following copy of the description: "The Moth belongs to the PHAL. NOCT. SPIRILLINGUES LEVES of LINNÆUS; the under side of the wing is of the same color with the upper side of the under wings, the black mark of the interior margin of the upper wings only appearing. We shall name it CLYMENE."

primaries, costal vein terminating at about third fourth of costa, instead of at fourth sixth.

"All the subcostal branches emitted separately, whereas in *Hypercompa* the third and fourth are emitted from a long pedicle or footstalk.

"Supplementary (or post-discal) cell much narrower and more elongated, emitting last subcostal branch from its inferior margin, instead of from its extremity.

"Upper radial emitted near to, but not from anterior angle of discoidal cell; lower radial also emitted further from inferior angle of same.

"Second and third median branches emitted nearer together.

"Secondaries with longer and straighter costal margin.

"Subcostal branches emitted from anterior angle of cell and not from a pedicle, as in *Hypercompa*."

A careful examination of a number of specimens of several species convinced me that the characters given by Mr. Butler are not constant. The shape of the accessory cell varies greatly, sometimes narrow and linear, and again nearly as broad as long, while the veins arising from it are sometimes all separated or partly (in one case all) from a stalk. The other features are not less inconstant and I cannot see the propriety of a separate generic term for our species.

However, Mr. Butler's notes have affected the synonymy of the yellow winged species to some extent, and that given in the text must be amended as follows:

C. clymene Brown.

interrupto-marginata DeB. et auct.

comma Wlk.

C. colona Hb.

clymene || Esp. et auct.

carolina Harr.

I regret that it becomes necessary to disturb the established synonymy in this genus, especially as the new application of the name *clymene* is apt to cause confusion for a time; yet I presume, even at the end of one hundred years, an error or injustice should be rectified.

It may not be amiss, either, to call attention to the fact that whereas Canadian collectors have very generally contended for the specific distinctness of some of the forms of this genus, the late Jacob Boll claimed that he had raised *all* the species of the genus from larvæ feeding on the same species of plant (see Riley, Gen. Index and Suppl. to Mo. Repts., p. 55), and Prof. Riley assures me that he has seen Mr. Boll's series, including all the known species, and believes his statement. I can only say that I find it impossible to do so. The species seem to me as well separated, with the possible exception of the immaculate forms, as species are in any other family of the Lepidoptera.

I must also express my gratitude to Mr. Butler for his great courtesy in placing at my disposal so freely his notes on the genus.